THE

YOUNG MECHANIC.

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OBSERVATIONS ON DRAWING INSTRUMENTS.

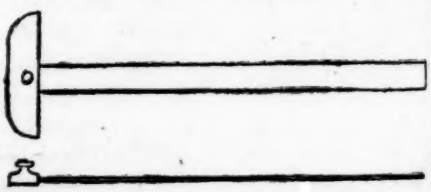
[Continued from p. 52.]

RULERS.

RULERS for accurate purposes should be made of glass, steel or brass; those formed of the latter metals are liable to contract, tarnish and rust, and to soil the paper. Those made of ebony, boxwood or ivory, are preferred for general purposes; still no artist should be without accurate brass or steel rulers of considerable length, to lay down his principle lines, and to verify his smaller scales. A very convenient standard may be made of 3 feet or a yard in length, with one edge chamfered, and divided into feet and decimals of a foot; the other side being left the full thickness of the ruler, is used to draw lines in ink by, while the former is for the pencil, both being made very exactly straight. When rulers are made of wood, it should be of very close texture, straight grained, well seasoned, and not liable to warp. The edges which are used for the pencil should be bevelled, and those for the pen rather thicker. As the weather is so changeable in this country, the student should verify the edge of his rulers often. To do this, it is only necessary to lay the rule on some paper nicely stretched, and draw a very even line along the edge; then apply the ruler to the opposite side of the line so drawn, and if it is not perfectly straight the error will be discoverable at once, because this mode of trial doubles it, and thus renders the smallest deviation apparent. For small rulers and divided scales, ivory or ground glass is the best substance; being very smooth the drawing pen slides freely against it and draws beautiful lines. The divisions also when filled with black can be seen much better than any other substance. The only objection there is to it, is the liability to warp at every change of weather; but if carefully selected, some pieces are found to preserve their straightness without much deviation for a great length of time. The best are formed from the centre of the tooth, having the grain radiating every way from the centre of the ruler

to the edges, and thus an equilibrium is preserved in the expansion and contraction. Scales of about 12 inches in length are extremely useful for plotting. They are divided into different parts of inches, which are subdivided into tenths and twelfths. They are much more accurate and convenient for drawing than scales made on paper; the divisions being on the edge of the scales, we can prick off any distance by the compasses. A small offset scale of two or three inches in length, and graduated with divisions of the same value of those on the long scale, will often be found very useful. The ends of the offset must be exactly perpendicular to the sides, and when it is applied to the edge of the scale, which is held fast down upon the paper, while the offset slides along its edge, any number of lines may be drawn by the edge of the offset, and will always be parallel to each other. The principal object of this offset is to project points on irregular curved lines, to represent brooks, fences, ditches, &c., on maps. Such rules will be found very useful to those engaged in protracting surveys, or copying plans by squares; indeed they will be found serviceable in all cases. Parallel rulers are of various kinds. The simplest, and those in most common use, consist of two light and flat rulers, which are united together by two brass links of equal length, and the two parts on each ruler where these are joined, being of the same distance apart from a parallelogram. The joints moving freely, the two rulers may be separated and will always be parallel. In using this kind of ruler, the edge is placed to coincide with any line, and the opposite ruler held fast down to the paper; the first ruler may be pushed out to any distance from the former within the limits of the links, and always preserving its parallelism; a line may be drawn along its edge parallel to the former. As this ruler is limited in its extension, others have been contrived to obviate this difficulty; one kind being made with three rulers, the middle one closing into the others, and connected to them by four links. This kind, laboring under some of the imperfections of the first, though having been improved in various ways, (which renders it a very useful instrument,) has been succeeded by a ruler, invented by Eckhardt, a German, which is a very beautiful contrivance. It is a broad thin ruler made of ebony or brass, and has slips of ivory inlaid at its edges, which are chamfered, on which divisions of inches and decimals are marked to answer the purpose of an ordinary plane scale. This is caused to move parallel to itself by means of two small brass wheels, which are fixed to a common axis, the opposite ends of which having pivots or bearings, fit into sockets which are made on the ruler and which support it as it is moved along the paper. The wheels are slightly indented or made rough upon their circumferences similar to a small cog-wheel, which gives them a hold and prevents them from slipping on the paper. Both being made of the same diameter, they carry the rule forward equal distances, and thus the edge always moves parallel. The distance which the ruler moves is measured at the same time by two small wheels of ivory, fitted on the axis by the side of the brass wheels, which

have divisions on their circumferences, which are so proportioned to the size of the ruler that each division is equal to one-tenth of the rulers motion, and these may be subdivided by sight. The divisions are read against an index which is made upon the little piece of brass which sustains the pivots of the axes of the wheels. In rolling the ruler, one hand only must be used, and the fingers should be placed very nearly in the centre, that one end may tend to move as fast as the other. The edge should be raised a little from the paper as it moves, so as to allow the wheels only to touch it; and the surface of the paper should be very smooth and free from protuberances. To draw lines at *determined* distances from each other, if the rule is moved from you, the distance is to be adjusted by the right hand ivory cylinder; if towards you, the left is to be used. This rule is exceedingly useful to raise and let fall perpendiculars to given lines; to do so, we have only to place the edge of the ruler to the line, bringing some division against the given point, which the perpendicular is to pass through, then rolling the ruler, we mark off either above or below the line, a small point with a protracting pin or pencil, against the assumed division, then lifting up the ruler we draw the perpendicular. Many other parallel rulers have been invented, but after all, none are so accurate, or possesses such evident advantages as the common T square or bevil, which is used against the side of the drawing board. The inconveniences attending this when we have not a drawing board at hand, gave rise to the many contrivances which have been enumerated. This as commonly used is too well known to require any description; but the best and most convenient kind is made of mahogany, or some other kind of wood which is well seasoned, and consists of a long flat rule about three feet in length, two inches broad and an eighth of an inch thick, one end of which is fitted into another piece about 9 inches or a foot long, and having a screw with a milled head passing through it for clamping it to the blade, and which serves for a pin for the rule to turn on. This rule may be constructed by any joiner. The annexed figure



represents the best kind. It is intended to answer the double purpose of a square and bevel. The effect which every change of weather has upon the T square, soon deranges it and renders it useless. Therefore I would advise the student to have two bevels made in preference. The tongue may be adjusted in a very simple manner perpendicular to the side of the stock by laying it on the drawing board, and drawing a fine line against the edge of the ruler, then reversing the ruler, and drawing another line through some point in the former. The error if any occurs will be doubled. The angle which is made by the two lines so drawn may be divided equally and the blade of the ruler adjusted to the new line, which will be perpendicular to the edge of the stock. Small triangular pieces of boxwood or ivory to slide on the edge of the ruler are very convenient for

drawing lines perpendicular or parallel to one another. The student should provide himself with two, the angles of one being 90° and 45° and those of the other 90°, 30° and 60°, the latter being much used in isometrical perspective. Another useful instrument for the same purpose, may be made of two rulers jointed at the end like a sector, and having a small screw for clamping, similar to the screw on the bevel. The inside edges may be chamfered and divided into inches and tenths, which may be used for drawing lines parallel and anti-parallel, or reversed, or making the same angle in the opposite direction. It will also when applied to the edge of a ruler divide a line into any number of equal parts, which may be effected as follows. Thus for instance, suppose the space between any two points *a* and *b* upon any line *ab*, is to be divided into 7 equal parts, open the ruler and bring the division 7 on the inside against the point *b*, then stretch open the rulers so as to take in the whole line *ab*. Place the edge of a long ruler against the lower limb of the bevel, and slide the bevel against the ruler till the division 6 intersects the line *ab*, then draw a mark by the edge of the bevel cutting the line *ab* at 6, move the ruler again to 5 and proceed in the same manner, and so of all the rest and the line will be divided in 7 parts. It is plain that if it had been requested to divide it into $7\frac{1}{3}$, it could be done in the same manner, by opening the bevel so much more as to bring the division $7\frac{1}{3}$ against *b*, instead of 7. It is for these fractional numbers that the instrument is chiefly useful, because it is so difficult to do them by compasses.

ARTS AND MANUFACTURES.

The arts and labors of the present age are signally characterized by the extensive and powerful application of steam. By means of this mighty agent nature has been conquered, her strong holds invaded, and her treasures laid bare. Urged by its powerful influence, man glides with immense velocity over the waters, rushes like the wind along the earth, and exerts a power over matter which, in force and intensity, almost equals the elements of nature.

It requires no great effort of the imagination to conceive, that those two mighty forces, gravity and heat, that hold together the principles and govern the operations of the material universe, have been made to yield a portion of their essence to facilitate the labors of man, and have thus enabled him to triumph over the laws and productions of nature.

The application of steam to the working of the press may justly be regarded as among the most important of its uses, since it extends the usefulness and augments the effects of printing by diminishing the labor and expense once attending this department of art. When we reflect upon the immense capacity of steam,

'fancy's busy work begins,' and we look to the time, when by means of its power, man will effect operations hitherto unknown in the history of art, and not conceived of even by the most imaginative mind.

The application of steam to locomotion and the propelling of vessels, is peculiarly worthy of notice; for it is one of the most useful inventions of the present age. By means of this application of the force, distant countries are brought into close communion, and thus the interest of commerce as well as manufactures is promoted, and what was once considered a toilsome journey or a long voyage, is now deemed merely an excursion of pleasure.

We have every reason to believe that this application of steam will ere long be very extensive and useful; since it is by means of it that vehicles are propelled upon railroads—those immense aids to human labor, which arouse such a spirit of enterprise in the towns and regions through which they pass; and in our own country if extended in their operations and number, they will not only minister to its general prosperity, but will serve the important purpose of connecting bands between the different states, and thus by joining their interests tend greatly to preserve that sacred union which exists between them. 'It is to that union we are indebted for all that makes us most proud of our country; it is to that union that we owe our safety at home and our dignity and consideration abroad.'

New England has attained a well merited character for her enterprise and invention. The province in which she seems most distinguished and which has obtained for her a just fame, are the improvements and additions she has made to machinery. Her inventions in this department have contributed to perfect the manufacture of many articles and to lessen the labor which formerly attended it. There is perhaps no branch of art to which the people of New England can better turn their attention, than the improvement and invention of machinery. It was but a few years ago that we were dependent upon Great Britain for almost every article connected with apparel, except the coarser materials of clothing. But manufactures have sprung up and extended their operations among us; and we may fairly anticipate the time when the rich silks of France, the fine cloths and cutlery of England, and even the gay plaids of Scotland, will be manufactured in abundance 'on the shores of America.' The air we breathe is free, the earth we tread is free. May the time come when our dress, our conveniences and even our luxuries shall all be American! Here where the spirit of freedom burns, may the spirit of enterprise and invention glow with equal intensity.

If we owe our progress in arts and manufactures to any particular influence, it is to that which education exerts, and it is to that we are to look for our future advancement. But there are other incentives which are capable of exerting a great and beneficial effect. The rising generation must understand the claims which the arts and manufactures have upon their attention and exertions.

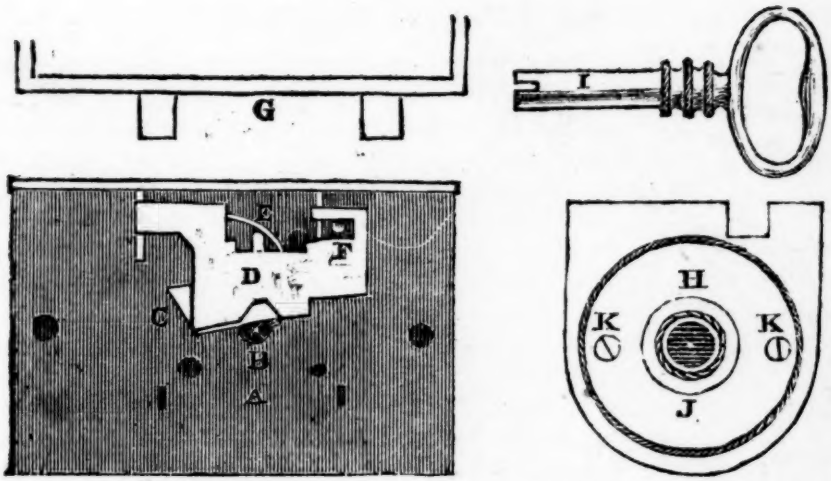
If there is any object which should interest the feelings and receive the attention and labors of man, it is the cultivation of arts and manufactures.

Situated as he is, with daily and hourly returning wants, subject to constant and various vicissitudes, it should be his study, as well as his pleasure, to exercise his faculties for the good of his fellow beings. Nature presents her varied stores in rich profusion, and God has given him a mind capable of constant and improving action.

The works of nature appear to have been created to employ the mind and augment the happiness of man, and her laws seem to have been framed to assist him in applying her principles to his own purposes. If the vegetable creation is adapted to feed the body, it is no less calculated to afford opportunity for the useful exercise of the mind. If the works of nature tend to excite feelings of adoration by their grandeur and beauty, they produce this effect in no less degree by their utility and adaptation to the wants and powers of man. Although the field of literary labor presents an opportunity for the most useful and honorable exercise of the mental faculties, yet that which the arts and manufactures afford is both extensive and accessible.

Every monument of human ingenuity and skill, as well as every effort in the department of literature, is a substantial proof that the sacred powers with which man is vested, have been neither squandered nor abused. The individual who has made useful discoveries in nature and new improvements in the arts, will be remembered with grateful emotions by his fellow beings, long after the trophies of the soldier have mouldered in oblivion; for he has benefitted his country, not by the blood he has shed, but by the additions he has made to her resources and usefulness.

It is however evident, that the full amount of good which may be reasonably anticipated from the progress of arts and manufactures, will only be realized in proportion as they become subjects of deep study and profound research. Mental labor is as essential to their promotion and perfection, as it is acknowledged to be indispensable in every work which has for its object any real and permanent good. The fact will strike every individual with peculiar force, who will survey the present practical condition of the mechanic arts, and see how much of mechanism and little of science is evinced. With us it is, comparatively, a new thing to treat the common arts of life, as subjects of mental investigation as well as of physical labor. But a new interest has been awakened in the subject, the happy influences of which are already evident, no less in the avidity with which useful knowledge is sought, than in the successful efforts of those institutions which have for their object its general diffusion.



ELLINGTON'S PATENT LOCK.

I TAKE the liberty of submitting, for your inspection, a lock (for which I have obtained a patent,) which, in itself, I may say (with the greatest mechanics who have seen it,) is the most secure and simple now in use.

A is the brass plate of the lock. B the pin which goes into the pipe of the key, having at the lower part a circular piece of brass, which revolves round it; this has four slits to receive the corresponding parts of the key. C the tumbler. D the bolt. E the spring to keep down the bolt. F the pin to secure the bolt in its place. G the staple (double link.) H the cap. I the key. K K the screw holes of cap. J the bush, or pipe.

The advantages of this lock will be obvious from the description. Instead of a great heavy key, with a large bit of iron (called a bit,) being required, as in locks of the kind now in vogue, you have a key so small, that it may be attached to the watch-chain; nor is there any possibility of the bit breaking in the lock, as is sometimes the case, and valuable articles of furniture being thus destroyed or damaged.

In the next place, there are no wards to break or bend; the brass circular revolving talon answers the place of the wards, shooting the bolt as it goes round. The slits answer the purpose of keeping out any false pipe or skeleton key which might be introduced. The cap of the lock is made with a large bush, similar to Mr. Bramah's patent, so as to leave no possibility of a picker entering.

The price of Mr. Bramah's lock is 8s. 6d.; but the utmost which can, with propriety, be charged for mine, is only 1s. 6d.; while it is equally, if not more, secure. Any of my make I will warrant beyond all possibility of being picked. SAM. ELLINGTON.

Lond. Mech. Mag.

THEORY AND PRACTICE.

It will not be denied, that the prosperity of this country depends in part on our *manufactures;* and these again, depend on improvements in *science* and the *mechanic arts.* No man can be said to be a finished workman, if he is ignorant of the *theory* on which his *practice* is founded. A man who is well versed in *arithmetic* and *geometry,* together with the laws or properties of *simple machines,* (improperly called *mechanical powers,*) with their effects, when combined, as in *compound machines,*—I say a man that understands these, and the laws of attraction, of simple and compound forces, the various properties of *æriform* and *watery* fluids, with some knowledge of *chemistry,*—such a man, if he sees a plan on paper, hears it described, or reads of it, especially if he is a *practical man,* will be able to judge of its merits more correctly, in less time and consequently at less expense, than if he were merely a workman. In the latter case he must construct his model. If this is done in a bungling manner, it will not perform, but he may conclude it would if it had been well made. This is all guesswork. I recollect reading an observation which goes to confirm this; 'that if a plan of the steam engine had been shown to Archimedes, he would have been able at once to say what it was capable of doing —that is, whether it would work, and what power it possessed.' Now if our mechanics understood the principles of science, what time and expense would be saved. PHILO.

MEMOIR OF THE LIFE OF EDMUND STONE.

Edmund Stone, a distinguished self-taught mathematician, was born in Scotland; but neither the place nor time of his birth are well known; nor have we any memoirs of his life, except a letter from the Chevalier de Ramsay, author of the 'Travels of Cyrus,' in a letter to Father Castel, a Jesuit at Paris, and published in the 'Memoirs de Trevoux,' p. 109, as follows:—'True genius overcomes all the disadvantages of birth, fortune and education; of which Mr. Stone is a rare example. Born the son of a gardener of the Duke of Argyle, he arrived at eight years of age before he learned to read. By chance a servant having taught young Stone the letters of the alphabet, there needed nothing more to discover and expand his genius. He applied himself to study, and he arrived at the knowledge of the most sublime geometry and analysis without a conductor, without any other guide but pure genius.

At eighteen years of age he had made these considerable advances without being known, and without knowing himself the prodigies of his acquisition. The Duke of Argyle, who joined to his military talents a general knowledge of every science that adorns the mind of a man of his rank, walking one day in his garden, saw lying on the grass a Latin copy of Sir Isaac Newton's

celebrated "Principia." He called some one to him to take and carry it back to his library. Our young gardener told him that the book belonged to him. "To you!" replied the Duke, "Do you understand geometry, Latin, Newton?" "I know a little of them," replied the young man, with an air of simplicity arising from a profound ignorance of his own knowledge and talents. The Duke was surprised; and having a taste for the sciences, he entered into conversation with the young mathematician: he asked him several questions, and was astonished at the force, the accuracy, and the candor of his answers. "But how," said the Duke, "came you by the knowledge of all these things?" Stone replied: "A servant taught me, ten years since, to read: does one need to know any thing more than the twenty-four letters in order to learn every thing that one wishes?" The Duke's curiosity redoubled; he sat down upon a bank, and requested a detail of all his proceedings in becoming so learned. "I first learned to read," said Stone: "the masons were then at work upon your house: I went near them one day, and I saw that the architect used a rule and compasses, and that he made calculations. I inquired what might be the meaning and use of these things; and I was informed that there was a science called arithmetic. I purchased a book of arithmetic, and learned it. I was told there was another science called geometry. I bought the books, and I learned geometry. By reading I found that there were good books on these two sciences in Latin. I bought a dictionary, and I learned Latin. I understood also that there were good books of the same kind in French. I bought a dictionary, and I learned French. And this, my lord, is what I have done. It seems to me that we may learn every thing when we know the twenty-four letters of the alphabet." This account charmed the Duke. He drew this wonderful genius out of his obscurity; and he provided him with an employment which left him plenty of time to apply himself to the sciences. He discovered in him also the same genius for music, for painting, for architecture, for all the sciences which depend on calculations and proportions.

"I have seen Mr. Stone. He is a man of great simplicity. He is at present sensible of his own knowledge; but he is not puffed up with it. He is possessed with a pure and disinterested love for the mathematics; though he is not solicitous to pass for a mathematician; vanity having no part in the great labor he sustains to excel in that science. He despises fortune also; and he has solicited me twenty times to request the Duke to give him less employment, which may not be worth half of that he now has, in order to be more retired, and less taken off from his favorite studies. He discovers sometimes, by methods of his own, truths which others have discovered before him. He is charmed to find on these occasions that he is not a first inventor, and that others have made a greater progress than he thought. Far from being a plagiary, he attributes ingenious solutions, which he gives to certain problems, to the hints which he has found in others, although the connection is but very distant," &c.

Mr. Stone was author and translator of several useful works; viz. 1. "A new Mathematical Dictionary," in 1 vol. 8vo. first printed in 1726. 2. "Fluxions," in 1 vol. 8vo. 1730. The Direct Method is a translation from the French of Hospital's "Analyse des Infiniments Petis;" and the Inverse Method was supplied by Stone himself. 3. "The Elements of Euclid," in 2 vols. 8vo. 1731. A neat and useful edition of these Elements, with an account of the life and writings of Euclid, and a defence of his Elements against modern objectors. Beside other smaller works. Stone was a fellow of the Royal Society, and had inserted in the "Philosophical Transactions," (vol. xii. p. 218) an "Account of two species of Lines of the third Order, not mentioned by Sir Isaac Newton or Mr. Stirling." *Lond. Artisan.*

PATENTS FOR MASSACHUSETTS.

GRANTED IN JUNE, JULY, AUGUST AND SEPTEMBER, 1831.

June.

32. For machinery for *washing rags in the manufacturing of paper.* David Ames, Jr., and John Ames, Springfield, assignees of Samuel Eckstine, Philadelphia, June 13.

33. For a *washing machine.* Samuel Jinkham, Enfield, June 13.

34. For a *churn.* Philip H. Kimball, Salem, June 13.

35. For a machine for *separating grain, rice, peas, grass-seed, flax-seed, &c.* from the straw, and for cutting straw. Abel Lock, Pittsfield, June 13.

July.

36. For an improvement in the *making of pasteboard or other paper.* Frederic A. Taft, Dedham, July 20.

37. For machinery for *cutting leather,* or other substances into any desired shape at one operation. George Domett, Boston, July 20.

38. For improvements in the construction of *candle moulds.* Timothy J. Dyre, and Anthony Richmond, New Bedford, July 20.

39. For a *plough.* Barnabas Thatcher, Jr., Barnstable, July 20.

40. For a machine for *making hooks and eyes.* James Stewart, formerly of Montrose in Scotland, but for two years past a resident of Boston, July 20.

41. For a *compound revolver for roping cotton.* Asa Whitman, and Joel Baker, Walpole, July 20.

42. For an improvement in the *printing press.* Otis Tufts, Boston, July 30.

August.

43. For machinery for *jointing staves.* Isaac Forbes, Bridgewater, August 3.

44. For an improvement in the common *pump* for pumping water. Jesse Reed, Marshfield, August 5.

45. For *shears for cutting pasteboard, sheet iron &c.* Alvah Hardy, Boston, August 12.

46. For improvement in the mode of *fastening the soles and heels upon a boot or shoe*, with wooden or metal pegs, and of paring the same. Wales Tileston, Charlemont, August 18.

47. For an improvement in the art of *distillation.* John Cairou, Boston. Patent issued January 10, 1831; surrendered on account of a defective specification, and resumed August 22.*

48. For an improvement in the mode of *making beds*, called the 'spring bed.' Josiah French, Ware, August 25.

49. For a machine for *making clapboards from round logs.* Herald Whittemore, Worcester, August 26.

September.

50. For a machine for *shelling and cleaning corn.* Jesse Reed, Marshfield, Sept. 1.

51. For an *anthracite cooking stove.* Walter Bryant, Boston, Sept. 13.

52. For a *shingle machine.* Chery Reed, Worcester, Sept. 28.

53. For an economical *baker and roaster.* Philip Wilcox, Springfield, Sept. 28. *Journal Franklin Institute.*

OIL FOR DELICATE MACHINERY.

The oil for diminishing friction in delicate machines, ought to be completely deprived of every kind of acid and mucilage: and to be capable of enduring a very intense degree of cold without freezing. In fact, it ought to consist entirely of *elaine* or the *oily* principle of solid fat, and to be perfectly free from *stearine* or *solid fat.*

Now it is not a difficult matter to extract the *elaine* from all the fixed oils, and even from seeds, by the process recommended by Chevreul, which consists in treating the oil in a matrass with seven or eight times its weight of alcohol till boiling. The liquid is then to be decanted and exposed to the cold; the *stearine* will then separate from it in the form of a crystallized precipitate. The alcoholic solution is afterwards to be evaporated to a fifth part of its volume, and the *elaine* will then be obtained, which ought to be colorless, insipid, without smell, and incapable of altering the color of the infusion of litmus or turnsole, and having the consistence of pure white olive oil. *Select.*

* This patent was rendered defective by Mr. Cairou supposing that if he sent a good model instead of a drawing, and reference in his specification to the model, it would answer the same purpose as a drawing; an error into which inventors often fall, from not understanding the Law of Patents.—The law says: 'and shall accompany his specification with drawings and written references thereto, wherever the nature of the case admits of drawings.' The Secretary of State has the power vested in him of requiring the patentee to furnish a good model of his invention if he deems it necessary, which model is preserved in the Patent office for the information of those visiting the office, and is no farther than this connected with or essential to the specification. EDS.

TUFTS' PRINTING PRESS.

THE above cut is a representation of a very beautiful hand printing press constructed and patented by Mr. Otis Tufts of this city. The elegant form of the arch, we may safely say, surpasses all others, and reflects great credit on the inventor. The movements are very simple and easy; by a peculiar combination of the parts the pitman is driven forward in a straight direction, and acts always perpendicularly on the progressive levers or 'toggle joints;' while in most of the other presses they are straightened by their pitmans acting diagonally to them. We discover in viewing this press that Mr. Tufts has calculated his arch upon the truest mathematical principles, to bear a powerful strain before breaking; and we should not hesitate to say that the same quantity of metal converted into an arch of the above form would bear a much greater strain before it separated than it would in any other arch now in use. We judge of the utility of the press from the many testimonials in its favor from the printers of Boston and others who have used it. We hope it will prove a source of profit to the maker, and cheerfully recommend it to the attention of the public.

SINGULAR APPLICATION OF HEAT.

Some years ago it was observed, at the *Conservatoire des Arts et Metiers* at Paris, that the two side-walls of a gallery were receding from each other, being pressed outwards by the weight of the roof and floors. Several holes were made in each of the walls, opposite to one another, and at equal distances, through which strong iron bars were introduced, so as to traverse the chamber. Their ends outside of the wall were furnished with thick iron discs, firmly screwed on. These were sufficient to retain the walls in their actual position. But to bring them nearer together would have surpassed every effort of human strength. All the alternate bars of the series were now heated at once by lamps, in consequence of which they were elongated. The exterior discs being thus freed from contact of the walls, permitted them to be advanced farther, on the screwed ends of the bars. On removing the lamps, the bars cooled, contracted, and drew in the opposite walls. The other bars became in consequence loose at their extremities, and permitted their end plates to be further screwed on. The first series of bars being heated, the above process was repeated in each of its steps. By a succession of these experiments they restored the walls to the perpendicular position; and could easily have reversed their curvature inwards, if they had chosen. The gallery still exists, with its bars, to attest the ingenuity of its preserver, M. Molard. *Select.*

NOTICES OF NEW PUBLICATIONS.

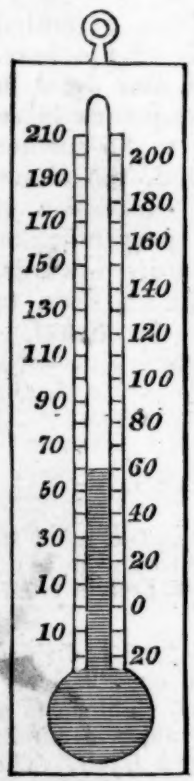
The North American Arithmetic. Part Second—uniting Oral and Written Exercises in Corresponding Chapters—by Frederick Emerson, late principal in the department of Arithmetic, Boylston School. Boston, Lincoln & Edmands. 12mo. pp. 192.

This very neat little volume is on the *inductive* principle, and is divided into two parts. The questions in the first part are to be answered verbally; those of the second part are done on the slate. This book is adapted to teaching in *classes*. By this method it is said more pupils may be taught in the same time, and that they will learn faster. The whole work seems to have been prepared by an experienced teacher. Fractions are treated in a very clear manner. There are a variety of *cuts* to explain them inserted in the pages where the questions occur. We think this a valuable addition to our school books, and that it might be studied with advantage by our young mechanics.

We would suggest the propriety of reversing the *period* for a *decimal point*, so as to bring it half way up the type or figure. Many mistakes have been made in taking decimal fractions for whole numbers. By this method the mark would be known from all others, and mistakes would be less frequent. This plan is adopted in the Young Mechanic and some other works.

ELEMENTS OF NATURAL PHILOSOPHY, with Practical Exercises, for the use of Schools—by Francis J. Grund, author of an Elementary Treatise on Plane and Solid Geometry, &c. Boston, Carter & Hendee, and Richardson, Lord & Holbrook. 12mo. pp. 278.

THIS book, like the former works of Mr. Grund, we think will be well received. It is written in a clear, familiar style, is very concise, contains sound matter, and embraces the recent discoveries in the science of which it treats. The work contains ten chapters, which are subdivided into three hundred and fifty-four sections, with an appendix of questions, numbered to correspond with the sections in the body of the work. There are also notes containing mathematical calculations, and questions to these, also, in notes, which may be used or not according to the taste or ability of the learner. The cuts are numerous, well executed, and placed where they can most readily be examined. We extract the following from the section on the thermometer:



THE expansion of bodies by heat, and their contraction by cold, afford the means of measuring degrees of temperature. The instrument used for this purpose is called a *thermometer*. It is made of a hollow glass tube, which, having a hollow ball at the bottom, is nearly half filled with quicksilver. When this is done, the whole is heated until the quicksilver rises quite to the top. The top is then hermetically sealed; that is, so as perfectly to exclude all communication with the outward air. Then, in cooling, the quicksilver contracts, and consequently its surface descends in the tube, until it comes to a point which corresponds to the temperature of the air. When the atmosphere becomes warmer, the quicksilver expands, and rises in the tube; and contracts and descends again, when the atmosphere becomes cooler. By the side of the tube is placed a scale which is prepared thus:—The thermometer is brought into the temperature of freezing, by immersing the ball in water just freezing, or in ice just thawing, and the scale is marked where the quicksilver then stands, for the point of freezing. Then it is immersed in boiling water, and the scale again marked, where the surface of the quicksilver then stands. The distance between these two points is divided into 180 equal divisions or degrees, and the same degrees are continued 32 degrees further below, which point is then called zero; and as much below zero and above the boiling point, as is convenient; so that there are 212 degrees from the boiling point down to zero.

Quicksilver is now generally used for thermometers, it being very susceptible to the different degrees of heat; enduring great heat before it becomes transformed into vapor, and great cold before it becomes solid.

ANSWERS.

MESSRS. EDITORS—I observe the question 'Whether ten hours in twenty-four are sufficient for a mechanic to labor' is proposed for discussion in the pages of your Magazine; I therefore take the liberty of offering a few remarks on the subject, which, if destitute of other merit, may claim that of impartiality, as I am free from that excitement at present prevailing on the subject, and feel no personal interest in its decision.

The custom of working 'from sunrise to sunset,' which I believe has prevailed to a great extent among the mechanics of Boston, if not New England in general, is so absurd, and liable to so many objections, that I think a reform was certainly called for—but I cannot perceive the reasonableness of establishing the *same* specific number of hours of labor, (whether it be 10, 11 or 12,) for *every* trade without distinction or discrimination, and without regard to the fact of its being of a light or laborious nature;—the workmen out of doors or in—exposed to the heat and cold, or in a shop, enjoying the comforts of fire in winter, and shade in summer. These are circumstances which I conceive are worthy of consideration in the minds of reasonable and reflecting men, and a disregard of which, in deciding this question, would be acting on the principle of establishing a certain number of bushels of coal as a load for a horse, without regard to the circumstance of its being charcoal or anthracite, or the conveyance upon a rough road or railroad. Another consideration strikes me as deserving of notice, viz. that the nature of some trades is such, as in general to preclude their being worked at with convenience or safety, unless by daylight, which in Boston in the shortest days would fall short of ten hours, without any allowance for meals.

I have thrown out the above remarks rather by way of suggesting subjects for the consideration of those who may undertake to decide this question, than of attempting to answer it myself. Whenever work can be done by the piece, either at stipulated prices, or a certain quantity for a day's work, I think it in general, an arrangement more satisfactory to both parties, than that of working by the day; but as this cannot always be done, I am free to state as my own opinion, that I think ten hours of labor in twenty-four might be considered as a fair proportion for masons and carpenters engaged on buildings, from the nature of the work, which is laborious, and attended with exposure to the weather, and cannot be injured by competition from foreign importation. The same rule might be applied to other trades which are laborious; but as to those of a different character, and which, perhaps, have to contend with articles of foreign importation, I conceive eleven hours to be no more than reasonable. I might offer arguments in support of the sentiments advanced, but a due regard to brevity forbids it. I can only express a hope that all parties concerned in the decision of this question may act in accordance with the golden rule—remembering their interests in many respects are mutual—meeting each other in the spirit of good will—let the employer remember he was himself once of the class of the employed, as his children may also be; and let the employed reflect that they may themselves become employers, and that it is their mutual interest to settle the question, not on selfish principles, but on the principles of justice and reason.

R. E. R.

I OBSERVED a communication in the last Mechanic from C. D., in which he says he has repeatedly attempted to use caoutchouc, by dissolving it in the naptha from coal tar, (as recommended in an article on this subject, published in No. 3. p. 40,) but that he has never succeeded to his satis-

faction; for, although the naptha would readily dissolve the gum, yet it would not be dry, even after remaining exposed for twelve months; and he requests information in regard to the method of drying this solution. In answer to his request, I will endeavor to point out what I conceive to be the difficulty in his experiments. It may be seen in a note, appended to the article in question, that the distillation of the naptha, must be conducted at a *very gentle* heat. It is probable that more care is necessary in regard to the heat applied, than would generally be supposed. The reason is this, by a small increase of heat, a quantity of impure volatile oil is disengaged, and passes into the matrass mixed with the naptha. Although this compound will dissolve India rubber, yet, after the evaporation of this supposed naptha, a residuum will be left from the volatile oil, which will not evaporate, but will prevent the rubber from drying, or becoming elastic, and by this means disappoint the expectations of the experimentalist. If the naptha procured from one distillation should not prove to be pure, it can be made so by distilling it over. If this answer should be sufficiently clear for C. D. to give it a fair trial, with the precautions I have named, and his experiment should not be successful, I should be pleased to hear from him again, together with the results of his experiment, through the pages of the Young Mechanic.

J. M. W.

In answer to C. D. respecting grinding brass plates, probably I am not in possession of the best method, but the following will do very well. Procure a flat stone on which sift house sand rather fine; use water with it, and rub your plate on this stone, taking a sweeping motion similar to grinding paint; change the position of the plate very often. Flour of emery may be used, and plates of metal instead of stone. T. C.

QUESTIONS.

I should be obliged to some of your correspondents to inform me of the process of transferring prints from paper to glass. I have tried various methods, but from some cause do not succeed. D. C. M.

With four weights any number of pounds from one to forty can be weighed with common scales. What is the weight of each of the four?

Suppose a barrel containing 20 gallons to be half full of pure cider, and every time a pint is drawn from the barrel a quart of water is immediately added—when the barrel is full, how much cider will remain, the water diffusing itself equally through the cider? ☞

TO CORRESPONDENTS.

We have received a communication from J. R. C. it shall appear in our next. His offer is acceptable. Gulielmus is also received and shall have a place. An article on the apprentice question promised in our last is in type, but is unavoidably deferred till our next.

Errata.—In the last number, 54th page, and 14th line from the bottom, for *locomotions*, read *locomotives;* and 55th page, and 15th line from the bottom, for *Anderson*, read *Androssan.*